

**LESSON 5: INTRODUCTION TO MSDSs AND MSDS PHYSICAL  
HAZARD INFORMATION**

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## TRAINERS NOTES: Introduction and Learning Objectives

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*Ask trainees to look at the Introduction and Learning Objectives of pages 5-1 and 5-2 of their Student Workbook and emphasize the following:*

- **MSDSS** contain more detailed information than either warning labels or the Hazardous Chemical Inventory.
- How trainees can access the MSDS for chemical materials to which they may be exposed.
- The importance of knowing how to locate and use MSDSS to answer the questions listed on pages 5-1 and 5-2 of their workbook.

**Note:** *Following Videotape Segment 5A, you can refer trainees to any MSDS and ask them to use it to answer the following questions:*

Is it a solid, a liquid, or a gas?

Can I see it?

Might I smell it?

How fast does it evaporate?

How much of it can evaporate?

How much force does its vapor exert inside a closed container?

Is it heavier than air or lighter than air?

Is it heavier than water or lighter than water?

Is it soluble in water?

Does it float on water or sink in water?

*Similarly, you can use the following questions to provide practice using an MSDS following Videotape Segment 5B:*

*Can the chemical cause fires?*

*How do I put out a fire?*

*Can the chemical explode?*

*Is the chemical unstable or reactive?*

*What conditions or materials must be avoided?*

*How do I clean up a spill or leak?*

## LESSON 5: INTRODUCTION TO MSDSs AND MSDS PHYSICAL HAZARD INFORMATION

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### INTRODUCTION

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Material Safety Data Sheets (MSDSs) contain a great deal of useful information about chemical hazards. You have a right to review a copy of the MSDS for any chemical material in your work area simply by asking. This lesson helps you understand how to read an **MSDS**. You will see what kinds of general information and physical data the MSDS contains. Then you will see how to use MSDSS to help protect yourself from physical hazards of the hazardous chemicals in your workplace.

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### LEARNING OBJECTIVES

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When you have completed this lesson, *you* should be able to do the following

**Identify** general information that must be contained on an MSDS.

Use physical data on an MSDS to answer the **following** questions about a chemical material:

Is it a solid, a liquid, or a gas?

**Can** I see it?

Might I smell it?

How fast does it evaporate?

How much of it can evaporate?

How much force does its vapor exert inside a closed container?

Is it heavier than air or lighter than air?

Is it heavier than water or lighter than water?

Is it soluble in water?

Does it **float** on water *or* sink in water?

Use physical data on an MSDS to compare the vapor hazards of liquid chemicals.

Use MSDS physical hazard information to answer the following questions:

Can the chemical cause fires?

How do I put out a fire?

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**TRAINER’S NOTES: Learning Resources**

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Videotape Segments **5A** and 5B, located on Tape 2

**Note:** *On VHS or BETA videotapes, **all** seven segments are on one videotape.*

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**TRAINER’S NOTES: Directions for Proceeding**

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*Direct trainees to **disregard** page 5-2 and **proceed** to page 5-3 of the Student Workbook.*

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**LEARNING OBJECTIVES**

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**Continued**

- Can the chemical explode?
- Is the chemical unstable or reactive?
- What conditions or materials must be avoided?
- How do I clean up a spill-or leak?

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**LEARNING RESOURCES**

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- Videotape Segment 5A: Physical Characteristics Information
- Workbook Application Exercise 5A-1: Understanding General Information and Physical Data on MSDSS
- Workbook Application Exercise 5A-2: Using General Information and Physical Data on MSDSS
- Videotape Segment 5B: Physical Hazard Information
- Workbook Application Exercise 5B-1: Understanding MSDS Physical Hazard Information
- Workbook Application Exercise 5B-2: Using MSDS Physical Hazard Information
- Lesson Summary

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**DIRECTIONS FOR PROCEEDING**

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*Complete **the** following steps in order. You might want **to check** off each step as you complete it.*

- 1) Read the workbook introduction to Videotape Segment 5A.
- 2) Watch Videotape Segment 5A.
- \_\_\_ 3) Complete Application Exercise 5A-1 in this workbook.
- \_\_\_ 4) Complete Application Exercise 5A-2 in this workbook.
- \_\_\_ 5) Read the workbook introduction to Videotape Segment 5B.
- \_\_\_ 6) Watch Videotape Segment 5B.
- \_\_\_ 7) Complete Application Exercise 5B-1 in this workbook,
- \_\_\_ 8) Complete Application Exercise 5B-2 in this workbook.
- \_\_\_ 9) Read the lesson summary.

**STUDENT WORKBOOK: 5-2**

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## TRAINER'S NOTES: Introduction to Videotape Segment 5A

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**Note:** Ask trainees to *look* at the videotape introduction on page 5-3 of the Student Workbook

*Inform trainees that we're going to cover each section of the MSDS separately.*

■ As we watch this videotape, notice —

- the kinds of general information contained in the **first** section of the MSDS; and
- how you can use the information contained in the Physical Data Section to recognize chemical materials, vapor hazards, and special fire hazards,

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## **INTRODUCTION TO VIDEOTAPE SEGMENT 5A:**

### **Physical Characteristic Information**

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Every MSDS must contain certain kinds of information about the organization that prepared the document, the identity of the chemical material, and the material's physical properties,

As you watch this videotape segment, look for the kinds of general information that the MSDS must contain. Pay particular attention to the information included in the Physical Data Section. Notice how this data can help you recognize chemical materials, vapor hazards, and special fire hazards.

Now, watch Videotape Segment 5A.

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## TRAINER'S NOTES: Application Exercise 5A-1

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*Ask trainees to turn to page 5-5 of their Student Workbook. Either **lead** the class through Application **Exercise 5A-1** as a group activity, **or provide** time for students to complete the **exercise** individually or in **small** groups. The answers and additional information given below appear on pages 5-6, 5-8, and 5-10 of the Student Workbook.*

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Answer	Additional Information
1) ABC	Every <b>MSDS</b> must contain the name, address, and telephone number of the party responsible for preparing the document.  OSHA requires this information so that you can easily contact the responsible party.
2) A	One name on the MSDS must be the same as the name used on the label and the Hazardous Chemical Inventory in your workplace. But many chemical materials have more than one name. So, you may also see synonyms or trade names. The MSDS may also tell you that the material belongs to a chemical family or has a particular chemical structure. Section (g)(2) of the Hazard Communication Standard (29 CFR 1910.1200) contains very <b>specific</b> requirements for identifying chemicals on the <b>MSDS</b> .
3) B	Mixtures contain more than one ingredient. If the material is a mixture, the MSDS must <b>identify</b> all the hazardous ingredients.  <b>Paints</b> , preservatives, solvents, alloys, and metallic coatings are common mixtures, but any solid, liquid, or gas can be a mixture.



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**APPLICATION EXERCISE 5A-1 :**  
**Understanding General Information and Physical Data on MSDSs**

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*Directions: Check or **circle** your answer(s) to each question, or write your answer in the blank provided. Remember, **there** may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get **more** information about each question.*

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- 1) What information must the MSDS contain about the party who prepared the document?
  - A) Name
  - B) Address
  - C) Phone number
  
- 2) Can an MSDS include more than one name for a chemical material?
  - A) Yes
  - B) No
  
- 3) If the chemical material is a mixture, what must the MSDS identify?
  - A) Paints or coatings that are safe to use with it
  - B) Name of each hazardous ingredient
  - C) Other similar mixtures of liquids, solids, or gases

Answer      Additional Information

4) B      Evaporation rates are reported as comparisons. The evaporation rate tells you HOW FAST a liquid evaporates compared to water, in this case, the standard, which has an evaporation rate of one. That is, it tells you how quickly vapors get into the air from an exposed liquid surface.

Evaporation Rate (Water = 1)	Meaning
Less than 1(< 1)	Vaporizes <i>SLOWER</i> than water
1	<i>SAME</i> rate as water
More than 1 (>1)	Vaporizes <i>FASTER</i> than water

5) A, B, D      Vapor forms above the liquid surface inside a closed container. This vapor exerts a force on the walls of the container. The force is the vapor pressure of the liquid.

Like air pressure, vapor pressure is measured in millimeters of mercury (mm Hg). Vapor pressure increases as the temperature of a liquid rises.

Liquids with high vapor pressures at room temperature (greater than about 100 mm Hg) present a special hazard. The pressure inside a sealed container can make the container swell or burst open. This releases a hazard and is most likely to happen if a sealed container is exposed to heat.

Given a closed room, vapor pressure can tell you how much liquid will evaporate.

High vapor pressure will tell you how fast it gets into the air, as well.

4) Which chemical gets into the air faster?

A) 

Evaporation Rate 0.35 (Water = 1)
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B) 

Evaporation Rate 3.5 (Water = 1)
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5) What does vapor pressure tell you?

- A) How fast a chemical gets into the air.
- B) How much of the chemical can evaporate.
- C) Whether the vapor is lighter or heavier than air.
- D) How much force the vapor exerts inside a closed container.

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Additional Information

6) B                      Vapor density tells you whether a vapor is lighter than air or heavier than air, which has a density of 1.

Vapor Density (Air = 1)	Meaning
Less than 1 (<1)	<b>LIGHTER</b> than air. Tends to <i>RISE</i> , and get out of your breathing zone.
Greater than 1(> 1)	<b>HEAVIER</b> than air. Tends to <b>SINK</b> , <i>stay in your</i> breathing zone, and accumulate in low spots.

**Note:**    *If the **air** around **the** vapor **is** turbulent (**breezy**), the vapor may mix with air and **become** close to 1.*

7) A                      Specific gravity tells you whether a liquid is lighter than water or heavier than water, which has a specific gravity of 1.

Specific Gravity (Water = 1)	Meaning
Less than 1(< 1)	<b>LIGHTER</b> than water. <i>FLOATS</i> if not soluble in water.
Greater than 1(> 1)	<b>HEAVIER</b> than water. <b>SINKS</b> if not soluble in water.

**Note:**    *Direct **trainees** either to proceed to Application Exercise 5A-2 when finished, or to wait for further instructions. If time allows, ask the Optional Questions that begin on page 5-14 of this guide.*

6) Which vapor tends to sink in still air?

A) Vapor Density 0.80  
(Air = 1)

B) Vapor Density 1.52  
(Air = 1)

7) Which liquid is lighter than water?

A) Specific Gravity 0.60  
(Water = 1)

B) Specific Gravity 1.80  
(Water = 1)

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*Now go back to page 5-5, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a **self-study**, proceed to Application Exercise 5A-2, "Using General Information and Physical Data on MSDSs," when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.*

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**TRAINER'S OPTIONAL QUESTIONS: Application Exercise 5A-1 Continued**

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**01)** *Write the following BOILING POINTS shown on the chalkboard and ask:*

Which chemicals are gases at room temperature?

A) 15°F B) 110°F C) - 80°F D) 250°F

**Answer:** A, C

Gases have boiling points *BELOW* room temperature, which is about 68°F. Many gases have boiling points well below zero. In that case, the boiling point has a minus sign in front of it.

A boiling point of -80° F means that the material **changes** from a liquid to a gas at 80° *BELOW* 0°F.

**02)** *List choices and ask trainees:* What information do you need to tell if a liquid floats on water?

- A) Specific gravity
- B) Vapor density
- C) Volubility in water
- D) Appearance and odor

**Answer:** A, C; Specific gravity, water volubility

To float on water, a liquid must be lighter than water (**specific** gravity less than 1). It must also have little or no volubility in water.

Water **SPREADS** fire involving burning liquids that float on water — water does **NOT** put out fires involving such liquids.



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## TRAINER'S NOTES: Application Exercise 5A-2

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*Ask trainees to turn to page 5-11 of their Student Workbook. Either lead the class through Application Exercise 5A-2 as a group activity, or provide time for students to complete the exercise individually or in small groups. The answers and additional information given below appear on pages 5-12 and 5-14 of the Student Workbook.*

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*Do one of the following:*

- Refer trainees to the appropriate Appendix in their workbook and ask each question as is.*
  - Tailor the activity to your facility by handing out or projecting MSDSs for several commonly used chemical materials in your facility and asking questions similar to questions 1 through 4.*
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<b>Answer</b>	<b>Additional Information</b>
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	The MSDS for Automatic Transmission Fluid is located on pages A-4 to A-5 in Appendix A.
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1) A	Section 1 of the MSDS gives you an emergency telephone number to call for assistance. Calling this number is usually the fastest way to get the answers you need in an emergency situation. This puts you in immediate contact with the manufacturer or party responsible for preparing the MSDS. Writing for answers only works when you can afford to wait for the information.
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Most physicians know little or nothing about transmission fluid. With hundreds of thousands of chemical materials in use, you cannot expect OSHA to have specific information about any one product.

2) A	Look at Section 2 of the MSDS. It lists three ingredients: refined oils, anti-oxidant, and dye. Any material that contains two or more different ingredients is a mixture.
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**APPLICATION EXERCISE 5A-2:**  
**Using General Information and Physical Data on MSDSS**

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*Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.*

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*Locate the **MSDS** for Automatic Transmission Fluid in Appendix A and use it to answer the following questions.*

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1) What should you do if you need more information about Automatic Transmission Fluid in an emergency situation?

- A) Call 318-555-5214
- B) Call a doctor
- C) Write PO Box 3758, Anytown, OK 74000
- D) Write OSHA

2) Is this transmission fluid a mixture?

- A) Yes
- B) No

<b>Answer</b>	<b>Additional Information</b>
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3) B	Look at the APPEARANCE& ODOR information <b>in</b> the Physical and <b>Chemical</b> Characteristics Section, Section 3. It tells you that the <b>material</b> is a red, oily liquid.
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4) A, B	Again, look at the APPEARANCE& ODOR information in Section 3. It tells you that the material is a red, oily liquid. You can see the liquid, but you probably cannot see the vapor or mist that can be formed from the liquid. The MSDS also tells you that this transmission fluid has a slightly oily odor. This means you can smell it, but the odor is <b>faint</b> . So you may not notice the smell — especially if the air you are breathing contains only small amounts of vapor.
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**Note:** *Direct trainees either to **read** the introduction to Videotape Segment 5B when finished, or to wait for further instructions. If time allows, ask the Optional Questions that begin on page 5-20 of this **guide**.*

3) What is the **material's** physical form?

A) Solid

B) Liquid

g) Gas

4) How might you sense release of this transmission **fluid** in your workplace?

A) See it

B) Smell it

C) Can't sense it — chemical is **invisible** and odorless

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*Now go back to page 5-11, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a **self-study**, read the introduction to Videotape Segment 5B when you have finished. If you are taking this course in a **classroom** situation, wait for further instructions from your trainer when finished.*

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## TRAINER'S OPTIONAL QUESTIONS: Application Exercise 5A-2

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*Do one of the following:*

- . Refer trainees to the MSDS for Automatic Transmission Fluid in Appendix A (pages A-4 to A-5) of their Student Workbook and ask questions 01 to 05.*
  - Tailor the activity to your **facility** by handing out **or projecting** MSDSS for several commonly **used** chemical materials in your **facility** and ask questions similar to questions 01 to 09. Notice that optional questions 06 through 09 require comparing the **MSDSs** for two different materials.*
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01) In what physical forms can this material become airborne?

**Answer:** Vapor, Mist

Liquids become airborne as vapors and mists.

Also notice that Section 6 of the MSDS gives health effects associated with exposure to vapors and mists of this material.

02) Does the vapor tend to sink in air or rise in air?

**Answer:** Sink

Look at *VAPOR DENSITY* in Section 3. It says whether the vapor is heavier than air ( $> 1$  = density greater than 1) or lighter than air ( $< 1$  = density less than 1). In this case, the MSDS reports that the vapor density is  $> 1$ , which means *GREATER THAN 1*. Because the vapor is more dense than air, it tends to sink in air,

**STUDENT WORKBOOK: No Reference**

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## TRAINER'S OPTIONAL QUESTIONS: Application Exercise 5A-2 Continued

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03) Is this transmission fluid lighter than water?

**Answer:** Yes

Look at the **SPECIFIC GRAVITY** given in Section 3. It tells you whether the material is lighter than water (**specific** gravity less than 1) or heavier than water (**specific** gravity greater than 1). This transmission fluid has a **specific** gravity of 0.87, which means it is lighter than water.

04) Does this transmission fluid float on water?

**Answer:** Yes

Look at the **SPECIFIC GRAVITY** and the **SOLUBILITY IN WATER**, which are both given in the Physical and Chemical Characteristics Section. Materials that float on water have a **specific** gravity less than 1 and little or no solubility in water.

This transmission fluid floats on water because it has a specific gravity of 0.87 and negligible solubility in water.

05) Does this transmission fluid present a vapor pressure hazard when stored inside a sealed container?

**Answer:** No

Look at the **VAPOR PRESSURE** given in the Physical and Chemical Characteristics Section. Vapor pressure tells you how much force the vapor exerts inside a **closed** container.

This transmission fluid has a low vapor pressure, 2,7 mm Hg. Thus, it does not present a vapor pressure hazard when stored inside a sealed container. Materials having vapor pressures above 100 mm Hg are especially hazardous.

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*Refer trainees to the MSDS for methanol (pages A-8 to A-9) and 732 Sealant (pages A-10 to A-n) in Appendix A of their Student Workbook and ask questions 06 through 09.*

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## TRAINER'S OPTIONAL QUESTIONS: Application Exercise 5A-2 Continued

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06) Which chemical material becomes airborne faster?

**Answer:** Methanol

Compare the *EVAPORATION RATES* given in the Physical and Chemical Characteristics Section, Section 3. These rates tell you how fast the material evaporates in comparison to butyl acetate (the standard in this case), which equals 1.

Methanol has an evaporation rate of 5.9, whereas the sealant has an evaporation rate of less than 1. Both are compared to butyl acetate. Thus, methanol becomes airborne faster than the sealant.

07) Which chemical material exerts more force on the inside of a sealed container?

**Answer:** Methanol

Compare the *VAPOR PRESSURES* given in Section 3. The higher the vapor pressure, the more force the vapor exerts on the inside of a sealed container.

Methanol exerts more force than the sealant because methanol has a vapor pressure of 97.3 mm Hg, whereas the sealant has a vapor pressure of less than 5 mm Hg. Notice that Section 4 of the MSDS for methanol tells you that containers heated by fire can explode. This hazard is caused by methanol's high vapor pressure. Note, however, that any container holding liquid may explode when heated, even one with water.

08) Overall, which chemical material becomes airborne more easily?

**Answer:** Methanol

Compare *VAPOR PRESSURE* AND *EVAPORATION RATE* in the Section 3.

Methanol becomes airborne more easily than the sealant because it has a higher vapor pressure (97.3 mm Hg for methanol versus <5 mm Hg for sealant) and it evaporates more quickly (rate 5.9 versus < 1 for sealant).



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**TRAINER'S OPTIONAL QUESTIONS: Application Exercise 5A-2 Continued**

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**09)** Which chemical material is more soluble in water?

**Answer:** Methanol

Compare *SOLUBILITY IN WATER* given in the Physical and Chemical Characteristics Section.

Methanol is completely soluble in water. The sealant has a solubility of 0.1 g per 100 g of water, but it is not completely soluble as methanol is.

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## TRAINERS NOTES: Introduction to Videotape Segment 5B

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**Note:** *Ask trainees to **look** at the videotape introduction on page 5-15 of the Student Workbook.*

■ *As we watch this videotape, you should learn to use MSDS Physical Data Sections to help —*

- *identify and control explosion hazards, fire hazards, and reactivity hazards;*
- *clean up chemical spills and leaks; and*
- *dispose of chemical wastes properly.*

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## **INTRODUCTION TO VIDEOTAPE SEGMENT 5B:**

### **Physical Hazard Information**

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You have seen that physical hazards include explosion hazards, fire hazards, and unstable or reactive chemicals. The MSDS identifies these types of hazards and provides information to help you control them,

As you watch this videotape, look for the kinds of information contained in the Fire and Explosion Hazard Data Section of the MSDS, and learn how to identify these hazards, Learn to use the Reactivity Data Section to identify unstable or reactive chemicals, and watch for ways of preventing hazardous reactions in the workplace. Finally, notice how the Precautions for Safe Handling and Use Section helps you clean up chemical spills or leaks correctly and dispose of the chemical waste properly.

Now, watch Videotape Segment 5B.

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## TRAINER'S NOTES: Application Exercise 5B-I

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Ask trainees to turn to page 5-17 of their Student Workbook. Either **lead** the class through Application **Exercise** 5B-1 as a group activity, **or provide** time for students to complete the **exercise** individually or **in small** groups. The answers and additional information given below appear on page 5-18 of the Student Workbook.

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Answer	Additional Information
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- |            |   |
|------------|---|
| 1) A       | <p>The flash point is the lowest temperature at which a liquid gives off enough vapor to ignite in the presence of an ignition source, such as a match, spark, or cigarette.</p> <p><i>FLAMMABLE</i> liquids have flash points below 100°F.</p> <p><i>COMBUSTIBLE</i> liquids have flash points at or above 100°F.</p>                        |
| 2) A, B, C | <p>The Reactivity Data Section of the MSDS lists conditions to avoid for unstable chemicals and polymerization hazards and incompatible reactions or materials. The conditions to avoid are those that might cause the chemical to decompose (break down into simpler molecules), or to polymerize (self-react to form larger molecules).</p> |
| 3) c       | <p>Reactive chemicals become hazardous when in contact with certain other chemical materials. Contact may cause a fire, explosion, or other violent chemical reaction. It may also produce or release a hazardous chemical.</p> <p>For this reason, the Reactivity Data Section lists materials to avoid for reactive chemicals.</p>          |

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**Note:** Direct trainees either **to proceed** to Application **Exercise** 5B-2 when finished, or to wait for **further** instructions. **If** time allows, ask the optional Questions that begin on page 5-32 of this guide.

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## APPLICATION EXERCISE 5B-1: Understanding MSDS Physical Hazard Information

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*Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be **more** than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to **get more** information about each question.*

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1) Which chemical material is flammable?

A)

Flash Point	70°F
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Flash Point	150°F
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2) For which materials must the MSDS list *CONDITIONS* to avoid?

- A) Unstable chemicals
- B) Reactive chemicals
- c) Polymerization hazards

3) If the MSDS lists *MATERIALS* to avoid, what kind of hazard is the chemical?

- A) Unstable
  - B) Flammable
  - C) Reactive
  - D) Combustible
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*Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. **If you are** taking this course as a self-study, continue to Application Exercise 5B-2, "Using MSDS Physical Hazard Information," when you have finished. **If you are** taking this course in a **classroom** situation, wait for further instructions **from** your trainer when finished.*

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**TRAINER'S OPTIONAL QUESTIONS: Application Exercise 5B-1**

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01) What is the upper limit of the flash point for a combustible material?

**Answer:** 200°F

All flammable and combustible liquids have the following in common.

- Flash point below 200°F
- Fire hazards

In general, materials with lower flash points are more hazardous than materials with higher flash points.

02) *Draw the following chart on the chalkboard and ask:* Which TWO chemical materials have the greatest potential for explosion?

	LEL	UEL
A)	5%	15%
B)	20%	30%
C)	20%	80%
D)	80%	98%

**Answer:** A, C

Materials with a *LOW LEL* (A) are extremely explosive because very little vapor needs to become airborne to form an explosive mixture.

Materials with a *WIDE EXPLOSIVE RANGE* (C) are also very dangerous because airborne vapors explode in almost any combination with air.





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## TRAINERS OPTIONAL QUESTIONS: Application Exercise 5B-1 Continued

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03) *List choices and ask trainees:* What information tells you about toxic gases or vapors formed when a material breaks down into simpler chemicals?

- A) Incompatibility
- B) Waste disposal method
- C) Extinguishing media**
- D) Hazardous decomposition products

**Answer:** D

Some unstable chemicals decompose or break down into simpler chemicals under commonly **occurring** conditions. Other chemicals decompose when heated or burned.

In either case, the Reactivity Data Section must list any known hazardous decomposition products, such as toxic vapors or gases.

04) *List choices and ask trainees:* Which section of the MSDS **identifies** proper waste disposal methods?

- A) Fire and Hazard Explosion Data
- B) Reactivity Data
- C) Precautions for Safe Handling and Use**

**Answer:** C

The Precautions for Safe Handling and Use Section of the MSDS provides two vital kinds of information —

- Steps to take if the material is released or **spilled**; and
- Proper waste disposal method.

Cleaning up a spill or leak properly is vital because using incorrect procedures can make the situation worse, create new hazards, and jeopardize health or safety.

Strict government regulations apply to the disposal of most chemical wastes. Disposing of even a small amount of chemical waste improperly can injure people, contaminate the water supply, or harm the environment.

**STUDENT WORKBOOK: No Reference**

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## TRAINER'S NOTES: Application Exercise 5B-2

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*Ask trainees to turn to page 5-19 of their Student Workbook. Either lead the class through Application Exercise 5B-2 as a group **activity**, or **provide** time for students to complete the **exercise** individually or in **small** groups. The answers and additional information given below appear on page 5-20 of the Student Workbook.*

*Do one of the following:*

- Refer trainees to the MSDS for Crystal Clear in Appendix A (pages A-2 to A-3) of their workbook **and** ask each question as is.*
- Tailor the activity to your **facility** by handing out or **projecting** MSDSS for several commonly used chemical materials in your **facility** and asking questions similar to questions 1 through 3.*

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Answer	Additional Information
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The MSDS for Crystal Clear is located on pp. A-2 to A-3 of Appendix A.

1) A, B, D

Look at the Fire and Explosion Hazard Data *given in* Section 4 of the MSDS. Crystal Clear is a fire hazard because it contains a **flammable** gas. It's **an** explosion hazard because explosive limits (LEL and UEL) are given.

The Reactivity Data in Section 5 of the MSDS tells you that Crystal Clear is stable, and that it does not undergo hazardous polymerization. It also tells you two kinds of materials to avoid — corrosives and active metals. Whenever the MSDS lists materials to avoid, the chemical is reactive.

2) A, B

Look at the MATERIALS TO AVOID listed in the Reactivity Data Section. It tells you to keep Crystal Clear away from corrosives and active metals, such as aluminum and magnesium. Whenever the MSDS lists Materials to Avoid, it means that contact with these materials can produce or release a hazard.

3) A

Look at the HAZARDOUS DECOMPOSITION PRODUCTS listed in the Reactivity Data Section. All four chemicals listed are toxic gases formed when Crystal Clear burns or decomposes. Carbon monoxide, phosgene and hydrogen chloride are deadly.

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## APPLICATION EXERCISE 5B-2: Using Physical Data on MSDSs

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*Directions: Check or circle your answer(s) to each question, or write your answer in the blank **provided**. Remember, **there** maybe **more** than one correct choice for a question. When you complete the **exercise**, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.*

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*Locate the MSDS for **Crystal Clear** in Appendix A and use it to answer the following questions.*

\_\_\_\_\_

- 1) What type(s) of physical hazards does Crystal Clear present?
    - A) Fire
    - B) Explosion
    - C) Unstable
    - D) Reactive
    - E) Polymerization
  
  - 2) Crystal Clear produces a hazardous situation when it comes in contact with :
    - A) Corrosives
    - B) Certain metals
    - C) Water
    - D) Air
  
  - 3) Does Crystal Clear produce any hazards when it burns or breaks down into simpler chemicals?
    - A) Yes
    - B) No
- \_\_\_\_\_

*Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. **If you** are taking this course as a self-study, proceed to the Lesson Summary when you have finished. **If you are** taking this course in a classroom situation, wait for **further** instructions from your trainer when finished.*

**Note:** *Direct **trainees** either to proceed to the Lesson **Summary** when finished, or to wait for **further** instructions. If time allows, ask the Optional Questions that begin on page 5-40 of this **guide**.*

**STUDENT WORKBOOK: No Reference**

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## TRAINER'S OPTIONAL QUESTIONS: Segment 5B-2

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*Do one of the following:*

- *Refer trainees to the MSDS for Crystal Clear in Appendix A (pages A-2 through A-3) of their workbook and ask each question as is.*
  - *Tailor the activity to your facility by handing out or projecting MSDSs for several commonly used chemical materials in your facility and ask questions similar to questions 01 to 05. Notice that optional question 05 requires comparing the MSDSs for two different materials.*
- 

01) *List choices and ask trainees:* What should be done if a fire breaks out in the vicinity of closed containers of Crystal Clear?

- A) Vent closed containers
- B) Cool closed containers
- c) Move closed containers
- D) No special actions required

**Answer:** B

If trainees discover a fire in the vicinity of Crystal Clear (or anywhere for that matter), they should call for help and clear the area unless they have been trained to fight fires.

The trained firefighters should be familiar with Section 4 of the MSDS, SPECIAL FIREFIGHTING PROCEDURES. It says that closed containers of Crystal Clear are under pressure and can explode when heated. To prevent explosion the containers should be cooled with a water stream. Trainees should do so only if they have been properly trained how to.

Venting the containers would be extremely hazardous because Crystal Clear is both flammable and explosive in air. Because of the pressure build-up and explosion hazard, handling or moving hot containers in a fire situation also presents an extreme risk to safety and health.





**02)** *List choices and ask trainees:* Which conditions are hazardous?

- A) Light
- B) Shock
- C) Heat
- D) Sparks

**Answer:** C, D

Look at the CONDITIONS TO AVOID given in the Reactivity Data Section, Section 5 of the MSDS. It says to avoid temperatures greater than 120°F.

All flammable materials must be kept away from ignition sources, such as sparks. The Precaution for Safe Handling and Use Section of the MSDS, Section 7, reminds users of this general rule.

**03)** *List choices and ask trainees:* What should you do if you spill Crystal Clear?

- A) Ventilate the area with an electric fan
- B) Mop it up
- c) Wash it down the nearest drain
- D) Use an absorbent to soak it up

**Answer:** D

Look at the STEPS TO BE TAKEN IN CASE OF RELEASE OR SPILL given in Section 7 of the MSDS. The MSDS says to use an absorbent to soak up the material. It also says to ventilate AND to remove ignition sources. Thus, an electric fan should not be used because operating electrical equipment can produce sparks that might ignite the spilled material.

Trainees should never mop up spills of hazardous liquids. Nor should they dispose of chemicals by pouring or washing them down the drain. Such practices can injure people, contaminate the water supply, damage the environment, start fires, or subject trainees to possible legal actions.



**04)** *List choices and ask trainees:* What is the proper method for disposing of waste containing Crystal Clear?

- A) Incinerate it
- B) Bury it in a landfill
- c) Consult government regulations
- D) Waste not hazardous — no special procedure required

**Answer:** c

Look at the WASTE DISPOSAL METHOD given in the Precautions for Safe Handling and Use Section of the MSDS. It says to follow government regulations when disposing of Crystal Clear waste. The correct disposal method may be to incinerate or bury it, but state and federal regulations must be checked to find this out.

All hazardous chemical materials, including Crystal Clear, produce hazardous chemical waste.

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*Refer trainees to the **MSDSs** for Gasoline (page A-12) and for Stainless Steel Cleaner and Polish (page A-14) in Appendix A of their workbook and ask question 05.*

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**05)** Which material presents the greater fire hazard?

**Answer:** Gasoline

Compare the FLASH POINTS given in the Fire and Explosion Hazard Data Section, Section 4 of the MSDS. The material with the lower flash point presents the greater fire hazard.

Gasoline has a lower flash point (- 45°F) than the cleaner (0°F). However, both materials have very low flash points and are extremely flammable,



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## TRAINER'S NOTES: Review of Videotape Segment 5A

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*If time permits, **review** and **reinforce** the learning objectives by asking the questions suggested below. Draw **trainees'** attention to the **tables** in the **Summary** of the Student Workbook. Point out that the tables summarize how to **read** and use the sections of the **MSDS** covered thus far.*

**Note:** *Make sure that you actually **provide practice** using **MSDSs**.*

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Q1) What general information must every MSDS contain (usually in the **first** section)?

**Answer:** Every MSDS must contain the following general information.

- . Name, address, and telephone number of the party responsible for preparing or distributing the **MSDS**, who can provide additional information on the hazardous chemical and appropriate emergency procedures.
- . Name of the chemical material as it appears on the warning label and Hazardous Chemical Inventory in your workplace. Section (g)(2) of the Hazard Communication Standard (29 CFR 1910.1200) contains very **specific** requirement for **identifying** chemicals on the **MSDS**.
- . Health hazards of the chemical, including signs and symptoms of exposure.
- Precautions for safe handling and use.
- . Any applicable control measures.

Q2) What is a mixture? What information must the MSDS provide about mixtures?

**Answer:** Many chemical materials are mixtures. Mixtures contain more than one ingredient. The MSDS must **identify ALL** hazardous ingredients in a mixture.

Q3) what types of liquids float on water?

**Answer:** Liquids that are not soluble in water either float (specific gravity less than 1) or sink (specific gravity greater than 1). Liquids that float on water present a special fire hazard. Water does not stop such liquids from burning. Instead, water spreads the **fire**.

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## LESSON 5 SUMMARY

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Every MSDS must contain the following general information.

- Name, address, and telephone number of the party responsible for preparing or distributing the **MSDS**, who can provide additional information on the hazardous chemical and appropriate emergency procedures.
- Name of the chemical material as it appears on the warning label and Hazardous **Chemical** Inventory in your workplace,
- Health hazards of the chemical, including signs and symptoms of exposure.
- Precautions for safe handling and use,
- Any applicable control measures.

Many chemical materials are mixtures. Mixtures contain more than one ingredient. The MSDS must **identify ALL** hazardous ingredients in a mixture.

The following table **summarizes** the information you will find in the **Physical Data Section** of the MSDS.

Physical Data	Question Answered	Explanation
APPEARANCE AND ODOR	Solid, liquid, or gas? What does it look like? Can I see/smell it?	MSDS describes physical form/appearance, color, and odor (if any).
BOILING POINT	<b>Is it a gas?</b>	YES if boiling point is BELOW room temperature
EVAPORATION RATE (STANDARD = 1)	How FAST does it evaporate?	FASTER than standard if rate GREATER than 1. SLOWER than standard if rate LESS than 1.
VAPOR PRESSURE (mm Hg)	How much FORCE does the vapor exert inside a closed container?	Higher is more hazardous. Over 100 mm Hg may cause container to burst open upon exposure to heat.
VAPOR DENSITY (Air = 1)	Is it heavier than air or lighter than air?	HEAVIER if GREATER than 1. LIGHTER if LESS than 1.
SPECIFIC GRAVITY (Water = 1)	Is it heavier than water or lighter than water?	HEAVIER if GREATER than 1. LIGHTER if LESS than 1.
VOLUBILITY IN WATER	Is it soluble in water?	NO if volubility none or a number near zero.

STUDENT WORKBOOK PAGE: 5-21

**Q1)** Which sections of the MSDS contain physical hazard information?

**Answer:** Physical hazard information appears in the —

- Fire and Explosion Hazard Data Section
- Reactivity Data Section; and
- Precautions for Safe Handling and Use

**Q2)** *If time permits, provide practice using the tables contained on pages 5-22 and 5-23 of the Student Workbook by asking questions such as:*

- What information tells you whether you can see or smell the material?

**Answer:** Appearance and odor,

- What does evaporation rate tell you?

**Answer:** How fast it evaporates.

- What does a specific gravity greater than 1 tell you?

**Answer:** The material is heavier than water.



Liquids that are not soluble in water either float (**specific** gravity less than 1) or sink (**specific** gravity greater than 1). Liquids that float *on* water present a special **fire** hazard. Water does not stop such liquids from burning. Instead, water spreads the **fire**.

Physical hazard information appears in the following sections of the MSDS.

- Fire and Explosion Hazard Data section
- Reactivity Data section
- Precautions for Safe Handling and Use section

The following table summarizes the information you will find in the **Fire and Explosion Hazard Data Section** of the MSDS.

Data	Question Answered	Explanation
FLASH POINT	Is it a fire hazard? Is it flammable? Is it combustible?	YES if below 200°F. YES if below 100°F. YES if 100-200°F. Lower is more hazardous.
LEL and UEL	Can it explode in air?	YES if limits given. Low LEL or wide explosive range most hazardous.
EXTINGUISHING MEDIA	What material should be used to put out a fire?	Use protective equipment and special procedures given.
SPECIAL FIRE FIGHTING PROCEDURES	How should firefighters put out a fire?	Use protective equipment and special procedures given.
UNUSUAL FIRE AND EXPLOSION HAZARDS	Is it a fire hazard? Can it explode?	YES if any information is given in either category.

Do *NOT* attempt to put out a chemical fire unless you have been specially trained to do so. Instead, sound the alarm and leave the area.

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**TRAINER’S NOTES**

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The following table summarizes the information you will find in the **Reactivity Data Section** of the MSDS.

Data	Question Answered	Explanation
STABILITY	Is it unstable? What conditions should be avoided?	YES if "Unstable" checked. Conditions to avoid are listed.
INCOMPATIBILITY	Is it reactive? What materials should be avoided?	YES if information given. Materials to avoid are listed.
HAZARDOUS DECOMPOSITION PRODUCTS	Does it produce or release a hazard when it decomposes?	YES if any products are listed.
HAZARDOUS POLYMERIZATION	Can it occur? What conditions should be avoided?	YES if "May Occur" checked. Conditions to avoid are listed.

The following table summarizes the information you will find in the **Precautions for Safe Handling and Use Section** of the MSDS.

Data	Question Answered	Explanation
STEPS TO BE TAKEN IF MATERIAL IS SPILLED OR RELEASED	How do I clean up a spill or leak?	Follow specific steps and procedures given.
WASTE DISPOSAL METHOD	What is the proper waste disposal method?	Follow specific methods given and refer to any government regulations.